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Are Female Executives Receiving Adequate Capital Financing? An Analysis of Gender Disparity on Venture Capital Funding

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Abstract

This paper examines the inequalities that exist between male and female CEO's and other top executives by analyzing the effect of gender diversity when it comes to venture capital funding and firm performance. Building off of previous research, I focus on three major areas. First, I utilize data from 2016 to 2018 found in PitchBook and Wharton Research Data Services (WRDS). Second, I explore the effect of firm performance prior to funding on the amount of capital received. Third, I narrow down the analysis of firms to 364 companies that were once venture capital backed and have successfully exited with an IPO within this time. I use separate models to estimate the effect of gender diversity on venture capital funding and firm performance thereafter. My findings suggest that gender diversity among executives appears to have a positive effect on venture capital funding, which is the opposite of what I hypothesized. Lastly, I find that female executives have an insignificant effect on firm performance after receiving funding.

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I. Introduction

"*Women are the largest untapped reservoir of talent in the World*."

- Hillary Clinton
American Politician and former First Lady of the United States at
the International Crisis Group Awards Ceremony (2012)

This quotation explicitly states the shortage of females in the corporate world, specifically in CEO and other top executive positions. In 2018, women accounted for 47% of the U.S. labor force (Warner, Ellman, Boesch 2018). However, in spite of this improvement in overall employment trends, women remain underrepresented as a whole at the CEO and management level, making up 7% of top executives in the Fortune 100 companies and occupying 10% of top management positions in S&P 500 companies (Warner, Ellman, and Boesch 2018). This continued gender inequality in executive positions makes gender diversity a relevant and pressing subject matter for both researchers and experts.

Existing literature in the United States explains the presence of gender diversity within top management roles and CEO positions, and analyzes gender's role on company culture, firm performance, and venture capital investment. This prior research shows that gender diversity enhances the overall morale of companies through the emphasis on a supportive and inclusive environment for female employees (McKinsey 2007; Dezso and Ross 2012; McKinsey 2013). The literature also depicts an improvement in firm performance, with a higher return on sales, return on equity, and return on invested capital (Catalyst 2007; Credit Suisse 2012). On another note, some of the literature emphasizes the difference in treatment and bias and or stereotyping against females in top executive positions (Everett, Thorne, and Danehower 1996; Herring 2009). Furthermore,

studies have found that these companies receive less venture capital funding, although they are just as successful and sometimes even more profitable than other companies that are run by men (Verheul and Thurik 2001; Poczter and Shapsis 2017; Brush, Greene, Balachandra, and Davis 2018). As gender diversity becomes more prevelant within the workforce, the subjects of venture capital funding and firm performance must be revisited with more recent data to examine the effect of having more widespread women leaders in the economic world.

Venture capital is crucial for sustaining an active environment in extremely innovative domains of the corporate world. VC firms activate the economy, provide useful management and networking assets to businesses, and enable new industries to thrive. The purpose of my paper is to inform my readers of the discrepancy in proper treatment by VC firms of female executives as opposed to their male counterparts. As mentioned earlier, venture capital firms tend to invest more in companies that have male CEO's or men in management positions in spite of the fact that female run companies have also been found to be increasingly profitable. Female employees and executives bring a hard work ethic, intelligence, and compassion into the workplace, which benefits many companies. However, without the sufficient funding necessary from VC firms, female run companies are evidently falling behind male run companies in this area. The negative stereotype of female executives is an important topic to address to enhance the overall corporate environment and values.

I develop my analysis of current literature by focusing on three main elements. First, I utilize data from 2016 to 2018, as compared to the analysis of the literature of Brush et al. (2018), which examines data from 2011 to 2013. Second, I explore the effect

of firm performance prior to funding on the amount of capital received. This aspect is crucial to look into because companies might only invest in those that appear to have been profitable in the past, rather than companies that have yet to prove their economic viability. Lastly, I narrow down the analysis of firms to 364 companies that have successfully exited with an IPO within this time frame and were once venture capital backed; previous literature has not analyzed companies that have exited with an IPO. It is important to examine venture capital funding's effects on a company becoming a publicly traded and owned entity. This concise and specific coverage of firms aids in establishing how gender diversity may influence the amount of VC funding and consequently, firm performance thereafter.

Using data from PitchBook, I find that gender diversity in the CEO position and executive roles influence VC Funding in an increasingly positive direction with a p-value of 0.053 and a coefficient of 0.346. Next, using data from WRDS, I find that firm performance post IPO is not affected by the gender of executives or amount of VC funding. My findings are different from existing literature. Specifically, Brush, Greene, Balachandra, and Davis (2018) find that as gender diversity increases, the amount of investment in female run companies is not as large due to stereotypes towards female leaders. Also, according to Dezso and Ross (2012), firm performance and company morale increase overall with females in leadership positions. In my study, an increase in gender diversity does not appear to affect firm performance in any significant way, which is inconsistent with what McKinsey finds (McKinsey 2007 and 2013). McKinsey finds that gender diversity in top management positions leads to greater returns and financial performance for a firm. The differences in results between my studies and existing

literature may be due to the different time period analyzed or could be due to the narrowing scope of firms examined: my study focuses particularly on U.S. companies that have exited with an IPO in the time period between 2016 and 2018. My different results might also represent the progress and improvements of the workplace as firms strive to be more gender inclusive and work towards a more gender-blind economy.

The remainder of my paper proceeds as follows: Section II covers the literature review. Section III discusses data. Section IV presents the empirical strategies and results of this study. And lastly, Section V concludes and states the limitations of my study as well as highlighting possible areas for future research to be conducted.

II. Literature Review

As of January 2017, there were about 11.6 million female-owned businesses that have generated more than $1.7 trillion in revenues as a whole, suggesting that women led businesses can be extremely successful (American Express Open 2017). In spite of this success, data from PitchBook shows that female founders only received 2.2% of $130 billion in VC funding in 2018 (Hinchliffe 2018). While the number of deals completed by female founders is growing, the percentage of money invested in female founded companies remains unchanged, according to Hinchliffe (2018). Even though the United States is seen as an economic forum where entrepreneurs can create an impact on the world through their innovative ideas, it is arguably not a forum with an equal playing field, at least when it comes to gender.

There are far fewer obstacles when it comes to male executives receiving funding (Williams 2019). According to Business Insider (2014), a few of the stereotypes women

face are that they are expected to have kids and quit their jobs, they are judged more harshly when expressing their opinions, and are viewed as naturally weaker than men. Furthermore, it has historically been easier for men to positively contribute to the economic environment because women have had, and continue to have to work harder than men to prove themselves (Zenger, Folkman 2012). VC firms must also put their money into women-led firms in order to enhance female creativity in this environment. The following sub-sections summarize the existing literature on gender diversity in general, in firm performance, and in the disparity in funding received by women (versus men).

2.1 Gender Diversity

According to McKinsey (2007), gender diversity benefits a firm's corporate image because it brings the company, its employees, and its shareholders together. Women have been a pivotal force behind great financial performance in terms of return on equity (+47%), stock price growth, and operating EBIT (+55%) (McKinsey 2013). Having more women in authoritative roles would also help in breaking the glass ceiling (the invisible boundaries to women's advancement to management teams).

Past literature has shown that the abilities, behaviors, and effectiveness of women in management positions are similar to that of men (Everett, Thorne, and Danehower 1996). However, there still seems to be different treatment towards female managers because of bias and stereotyping (Everett, Thorne, Danehower 1996). Over 92% of executive women report the existence of the glass ceiling. McKinsey (2013) claims that there is no single glass ceiling, but a leaky pipeline at each stage, where women can get

to the top, but only in spurts, and in ways that are often not related to talent. Many driven, passionate, hardworking women have reported to be willing to sacrifice part of their personal life to rise up in the corporate rankings, something most men are not required to do in order to get ahead (McKinsey 2013).

As females become more integrated into firms' top management, this arguably should lead to a more supportive social environment for working women (McKinsey 2013). These studies also focus on increasing engagement and support from men with regards to empowering women in the workplace. Inclusive corporate culture fosters an environment with increased female participation in management. However, progress is slow because while many companies have indicators in place, there is a lack of communication and follow-up on the effects of these indicators (McKinsey 2013). Exploring the impact that gender diversity has on firms is critical to understanding a firm's performance and the amount of capital received from VC firms.

2.2 Difference in Firm Performance

It is important to examine the effect women in management have on a firm's overall workplace dynamic. Previous research suggests that greater diversity in top management enriches the workplace by expanding employee perspectives, establishing solid team dynamics, and offering greater resources to resolve problems (Dezso and Ross 2012). According to Herring (2009), women are perceived (stereotypically) to be more focused on relationship development, while men are more concerned with making money and moving up in the hierarchy of a company. Furthermore, this research addresses the assumption that women are not interested in challenges or risk taking (Herring 2009).

However, according to Dezso and Ross (2012), women focus on a leadership style that emphasizes inclusion and is less hierarchical than that of many male leaders. The CEO of Sodexo, Michael Landel said “women like power, but they like to share it” (Womenomics 2009). Moreover, women promote the sharing of task relevant information so one would expect gender diversity to improve a team’s task performance, allowing everyone to give and produce more to their team (Dezso and Ross 2012). When there are more females on management teams, the example they set makes it more likely that women in lower positions have not only more mobility, but more courage to advance in the ranks of the company (Dezso and Ross 2012).

When looking at the effects of gender on firm performance, researchers have found that firms with more senior female executives and higher levels of gender diversity on management teams are associated with greater earnings (Catalyst 2007, Credit Suisse 2012). According to Credit Suisse (2012), the average return on equity (ROE) of companies with at least one woman in management is 16%, which is 4% higher than the average ROE with no female representation in management. This high metric for ROE implies greater cash flow generation. Accordingly, in 2007 Catalyst showed that Fortune 500 companies with women on management teams have a return on sales at 13.7% (versus 9.7% for those without females in management). Complementing these results, in 2011 Catalyst finds a 26% difference in return on invested capital (ROIC) between the top quartile companies with 19% to 44% of women on management and the bottom quartile companies with zero female managers. These results provide evidence of the positive influence women have on strategic decisions regarding the efficient use of capital received. With women on management teams, there is arguably a finer mix of

leadership skills, improved corporate governance, and a better understanding of consumers' needs and wants. Taken together, the gender composition of a firm not only influences a firm's performance but also the amount of capital received.

2.3 Disparity in Capital Provided

Access to capital is a consistent problem for female business owners, which is not as true when it comes to their male counterparts (Coleman and Rob 2009). In general, female entrepreneurs have not been perceived to be prepared or dedicated enough to run high potential businesses (Brush, Greene, Balachandra, and Davis 2018). Because of this false perception, venture capital firms often do not invest much (or any) capital in female business owners (Brush, Greene, Balachandra, and Davis 2018). This study also looked at the effects of industry and region on the amount of capital received by female-led firms and finds that women tend to receive more funding in the biotechnology industry and in Massachusetts and North Carolina, where the largest biotech investment communities are concentrated. Females have been found to run smaller companies for two reasons: they often specialize in small-scaled industries, such as the service sector, and they usually only receive an insufficient amount of equity capital due to lower salaries in earlier jobs (Verheul and Thurik 2001). Another reason or female entrepreneurs focusing on smaller businesses could be due to the effect of lower investment opportunities. Accordingly, it has been found that even when females do receive funding, they receive far less capital than male business owners in the same position would have (Poczter and Shapsis 2017). Poczter and Shapsis (2017) conclude that as a result of the smaller amount of funding received, women owned firms receive company valuations that are on average $685,000

less than those of all male firms. Interestingly, even though female companies have lower valuations, the study shows that female run teams have higher total sales than those run by men, even with the handicap of having less capital invested in their companies (Poczter, Shapsis 2017).

Even though women have taken steps to close this significant gender gap, research suggests entirely male-led firms are more likely to receive sufficient funding from venture capital companies than firms with even one woman in the management team. The idea that females appear to be more risk averse and hesitant to take on challenges is a stereotype created and perpetuated by men. It appears to be these types of gender disparities that limit the number of women in leadership positions. In order to combat gender inequality, it is necessary to analyze the effects of gender within firms.

2.4 Gaps in Literature

Although the previous studies, specifically Brush et al. (2018), make substantial progress in increasing our knowledge of the effects of gender diversity on the amount of funding received, there are a few key limitations to this study. First, Brush et al. (2018) utilizes data from 2011-2013, which is outdated given the fact that women have become far more involved in management since then (American Express Open). Second, the study does not include any performance metric of the firms prior to receiving funding. It would make sense to examine the correlation between positive performance of a firm and a VC company's decision to invest in that respective firm. Also, the study solely tested if there were female CEO's or females in top management positions. In order to fully understand the effects of gender diversity, it would be helpful to also see the effects of

females on management teams. Individuals in those roles have substantial amounts of power to make decisions for a firm and affect the workplace environment and productivity greatly.

This previous analysis also excluded firms that were backed by private equity, other forms of equity capital, or already had an exit. Many types of investments fall under the venture capital umbrella, whether it be private equity, angel financing, business incubators, etc. While there have been studies that have looked at these industries, their focus was not on gender (Verheul and Thurik 2001, Poczter and Shapsis 2017). Brush's paper does address the gender disparity in capital provided, but not among the various venture capital industries. The purpose of this paper is to examine the effect gender diversity may have on the U.S. economy. I expand on Brush's study by evaluating data from 2015-2018 on companies that have exited with an IPO. This is important because it combines the two sets of literature together and because of this, is crucial to understanding the effects of females in these industries.

III. Data

I utilize data from PitchBook, a company that delivers data and research on the private capital markets, from 2016 to 2018. This data set is ideal for the purpose of my study because it includes detailed variables on the amount of VC Funding, gender diversity (i.e., gender of executives and gender of individuals on management team), firm performance prior to exit (i.e., operating return on assets), demographics (i.e., region of the United States), type of industry (i.e., technology), and year of Initial Public Offering (IPO) exit (i.e., 2016, 2017, or 2018). I also use data from WRDS to obtain the average

annualized buy and hold return during the life of the publicly traded firm (or through the end of December 2018).

The sample includes companies that have successfully exited the market with an IPO in the last three years within the United States. All firms are included with the exception of those that were not formerly VC backed; moreover, the firms that I incorporate in this study were either once Venture Capital (VC) backed, Private Equity (PE) backed, Angel financing backed, or Incubator backed. I exclude companies that were not formerly VC backed because one of the two main purposes of this study is to analyze the determinants of the total amount of VC funding received by a firm that exited with an IPO. I also limited the study to only those companies located in the United States in order to have a more specific and consistent group of firms to analyze. Following the convention in literature, I only focus on U.S. companies. These restrictions result in a final sample size of 364 companies.

As stated earlier, VC funding is measured as the sum of the total venture capital funding received by a respective firm up until its exit as an IPO. This metric is measured in the dollar amounts raised throughout all funding stages prior to the IPO exit. Table 1 reveals the average VC funding is $336 million, with a minimum of $0.05 million and a maximum of $6,590 million; evidently, there is a wide spectrum of numerical values for VC funding among the companies in this dataset. Furthermore, I create a measure of the natural log of VC Funding, denoted ‘lnVCFunding,’ to take into account the large variation in data points. I expect that by taking the log of VC funding my regression would, in turn, have more significant results.

Using data from WRDS, the last dependent variable in my study is the average annualized buy and hold return during the publicly traded life of a firm (or through the end of December 2018). I use this metric as a measure of performance of the firm after their exit as an IPO. In other words, if you placed $1 at the IPO morning and held it until the end of 2018 or until the end of the life of this firm, then the average annualized return is how much money is generated from the investment. In this dataset, the average annualized return stands around -9%. The negative measure implies that these companies were possibly not ready to have an IPO and may have lost their value over time; notably, some of these firms could have gone bankrupt.

My main determinant of interest in my study is the gender of the CEO's and those in management (executive) roles. I created an indicator variable, denoted 'FemaleTOP5,' which is equal to 1 if either the CEO or any other executive is a female, and 0 if they are male. Management positions include Chief Financial Officer (CFO), Chief Operations Officer (COO), or a Chief Information Officer (CIO). The positions of these individuals in management vary based on the industry the firm is a part of. Although some of these firms do not have a female CEO, female executives are also very involved in making every day critical decisions for the businesses. Past literature has shown that the most important factor for VC investors is to identify a competent management team that can execute (Zider 1998). So evidently, the whole composition of personnel on the management team (not just the CEO) is important to VC investors.

In my study, I assume that the CEO's and other executives occupied these roles during the bulk of the venture capital funding period of these companies. It takes much more market proof to become a female CEO or executive than a male CEO or executive;

therefore, one would expect female CEO's and executives to have a lower turnover rate than males. This is because it is much less likely for females to acquire these positions to begin with due to gender discrimination and stereotyping. Moreover, I am going to make the assumption that if a firm currently has a female CEO, then at the time of the IPO, she was also the CEO. The same assumption holds for women in management (executive positions). I also expect that the quality of leadership of the female CEO and other female executives to be embedded in certain firm characteristics. By controlling by firm, I am also controlling for firm characteristics.

Table 1 shows that 29% of the firms in this dataset either have a female CEO or a female executive. This statistic seems pretty consistent with prior literature conducted on this topic, where leadership at most companies is composed of predominantly males (McKinsey 2013). Therefore, this measure sheds light on the disparity in the level of VC funding for female executives as opposed to male executives. It is also exhibited in Table 1 that there is an average of $337 million that is invested in companies with a male executive or a male CEO, compared to the mean of $332 million that is invested in companies with a female executive or a female CEO. These results support previous literature that there are discrepancies which lie in the amount of funding received between companies with male executives and female executives (Brush, Greene, Balachandra, and Davis 2018). Seemingly, the two means differ and therefore, the difference is significant at the 5% level, as shown in Column 1 of Table 2 (p-value of 0.002). In other words, it does appear that venture capital funding is lower for female executives. The remainder of my paper will formally analyze these patterns.

As shown in Table 1, the annualized return is negative for male executives, but not for female executives. It is worth noting that in the presence of a female executive, the average annualized return is positive at 7%. With a positive average annualized return, I would conclude that females occupying management roles have a positive effect on investment value after IPO. Interestingly, my results are in line with what has been the main discussion in the issuance area. Since yields on investment grade securities have been low for so long, investors, such as pension funds seeking returns, have been forced to seek these only in the market that is still yielding large returns: the equity market (Wiltermuth 2019). Thus, according to Wiltermuth (2019), companies that would not think about exiting the market with an IPO in the past are able to now do so with no profits, negative cash flow, and enormous cash burn. My results provide more evidence on the willingness on the part of equity providers to invest in companies that have not proven their economic viability yet.

I measure the average of the operating return on assets (ROA) percentage at the year of the firm's IPO exit. This measure shows how much of a dollar invested in assets generates earnings before interest and taxes (EBIT). Traditionally, companies exit with an IPO after generating at least a few fiscal years of profit. However, according to Wohlner (2012), in the last couple of years, investors have bought stock in a company based on expectations of profitability in the future rather than proven economic growth. In the past, venture capitalists would not have bought companies with losses at the IPO (Jasinski 2019). Accordingly, these investors would wait until they turn profits; however, investors who were not willing to accept companies with negative ROA's in the past have begun to accept them today.

I make the assumption that the operating return on assets (ROA) of each respective company met the expectations of venture capital investors regarding post funding returns. In other words, VC funding is dependent on the projections of ROA. The firms are not going to exit unless their ROA's come close to or surpass investors' expectations, so this metric is used as a proxy for ROA. Essentially, when I set the sample to include those companies that exit with an IPO, I presume that the reason for their exit is that the ROA expectations of investors got realized. Therefore, because I limit the sample to IPO exits, the actual ROA could be taken as a measure of their expected ROA in the future.

Table 1 reveals that the average operating ROA is -0.25. This statistic is not surprising, as initially a majority of the companies have negative ROA's. But, if an investor buys ownership in a company, it reflects their positive future expectations of the firm. In Table 1, one can see that the average operating ROA is negative for both female and male CEO's (-0.21 and -0.27). The two means appear to differ and are significant at the 1% level with a p-value of 0.000. Furthermore, this result indicates that there is a difference in the success of a company that is led by a female executive versus a male executive. These findings appear to support previous literature that explains how female run firms are comparable to or sometimes even more successful than male run firms, as shown by the higher mean ROA value (Verheul and Thurik 2001).

Also, I analyze the effects of which state of the United States the company is headquartered when it comes to total amount of VC funding. Accordingly, I assign an indicator variable to the state of the company's headquarters. I created four different indicator variables for specific states: Texas, North Carolina, New York, Massachusetts,

and California. I also created an indicator variable for firms with non-U.S. headquarters (denoted ‘nonusahq’) and one for states with missing headquarters (denoted ‘nohqstate’). Lastly, I grouped all other state variables that do not fall in the six aforementioned variables in a variable denoted ‘hq_othstate.’

According to Andrew Soergel (2018), four states controlled 80% of venture capital dollars, suggesting that the majority of business investment in the U.S. is centered in only a few states (California, Massachusetts, New York, and Texas). Table 1 illustrates that 27% of the companies within my sample are headquartered in California. California is a growing city in the technology space, with cities such as Silicon Valley and the whole of the San Francisco Bay Area (Soergel 2018). Massachusetts falls behind California at 13%, which has developed as an innovation focal point in New England (Soergel 2018). 5% of these companies are headquartered in New York and another 6% of these companies are headquartered in Texas. From these statistics, it might be meaningful for companies to then consider where their headquarters should be located in hopes of receiving sufficient VC funding.

A set of indicator variables is also included for year of IPO exit, whether the exit occurred in 2016, 2017, or 2018. I would expect time to play a factor due to potential inflation measures and trends in certain industries. Table 1 indicates that 45% of IPO’s occurred in 2018, 32% in 2017, and 23% in 2016. According to Jiang (2018), the boost in IPO activity in 2018 was led by the healthcare and technology industry. IPO funding prior to this year caused biotech companies to be well equipped to successfully get ready to go public. In 2014, there was a spike in the amount of companies that exited with an IPO, but due to market volatility in 2015, companies shied away from unloading shares

onto the public market (Marino 2015). However, according to this dataset, there has been a consistent positive increase in IPO exits from 2016 onwards.

Lastly, I assign an indicator variable for each industry the firms in the study are a part of. I created nine different indicator variables for the following industries: Pharmaceuticals and Biotechnology, Software, Healthcare, Commercial Products, Commercial Services, Exploration, Production, and Refining, Consumer Durables & Non-Durables, Other Financial Services, and all others grouped under 'Other industries.' Due to recent trends in the economy, some industries may be more prone to receiving funding from VC firms over others (i.e., technology, internet and retail, etc.). Aside from demographics, the type of industry a company identifies with is also very demonstrative for the purpose of my study. Artificial Intelligence is making its way into every facet of the world and, because of this 17% of companies in this data set are in the software sector. Moreover, AI is now infiltrating into data organization for the healthcare world. Due to new products and growing markets, the biotechnology market size in the U.S. in 2019 is now at $112.4 billion (IBIS World 2019). In this study, the percentage of companies in the biotechnology industry is 31%, which stands as the highest percentage for industries in the dataset. It is interesting to also note that 10% of the companies are in the Healthcare Devices and Supplies space.

According to Bio Space, only about 7-9% of CEO roles in biotech are filled by women; although this statistic might sound low, it is higher than any Fortune 500 company, where only about 4.2% are led by female CEO's (Terry 2018). On the same note, in this dataset women CEO's have higher representation in the pharmaceutical and biotechnology industry at 40%. Male CEO's constitute a higher percentage in the

software industry, as women in STEM see the most gender disparity at work (Funk, Parker 2018). This discrimination might lead to females not holding engineering roles and therefore widens the gap between the number of men and women in this field. Industry trends are evolving all of the time; it is advantageous for VC firms to invest in those companies that are within a booming industry, with the healthcare industry clearly at the top within this specific dataset.

IV. Empirical Strategy and Results

In order to determine the effects of gender diversity on venture capital funding and the effect of both VC funding and gender diversity on average annualized return of the companies, I utilize two separate Ordinary Least Squares (OLS) with adjusted standard errors to correct for auto correlation.

4.1 Venture Capital Funding

To more formally assess the impact of the presence of females in top management teams (including CEO) on the amount of VC funding received, I estimate the following model:

(1) $$\ln VCF_{ft} = \alpha + \beta \text{FemaleTOP5}_{ft} + \beta_1 \text{ROA}_{ft} + \eta_i + \eta_s + \eta_t + \epsilon_{ft}$$

where ‘lnVCF’ is the natural logarithm of the amount of venture capital funding received for firm f in year t. I took the natural logarithm of venture capital funding to account for outliers. ‘FemaleTOP5’ is an indicator variable equal to 1 if there is a female CEO or if there is a female top executive at the firm, and 0 otherwise. I use the combined measure because there are very few female CEO’s in my sample. I expect a negative coefficient for ‘FemaleTOP5’ since females are portrayed to be less successful than men (Verheul

and Thurik 2001). **'**ROA**'** is the measure of the operating return on assets, which is my proxy for the relative status of company performance for a firm *f*. I predict that the coefficient on ROA would be positive because if a firm is generating profits, it seems more likely that venture capitalists would choose to invest in that company (Brush, Greene, Balachandra, and Davis 2018). 'η_i' represents an indicator variable for each firm's industry. In the same respect, 'η_s' is an indicator variable for each firm's state headquarters and 'η_t' represents the year of IPO for each firm. I include these fixed effects to control for potential time, location, and industry specific effects not captured by the independent variables. 'ϵ' is an error term with the usual properties. Each of my models and their respective results are discussed in turn below.

I estimate a number of specifications where I successively add covariates to determine if the effect of 'FemaleTOP5' remains significant. Specifically, Specification 1 includes only 'FemaleTOP5.' Specification 2 is specification 1 plus 'OperatingROA.' Specification 3 is specification 2 plus the fixed effects for year, state, and industry. Table 2 shows the results from equation 1. I find that firms with females on their top management teams have higher levels of VC funding, although the magnitude and level of significance fall as more controls are added to the model. [1] In specification 1, the coefficient for 'FemaleTOP5' is significant at the 1% level (coefficient = 0. 5695; s.e. = 0.1861). The effect of the gender variable holds at the 1% level in specification 2 as well.

[1] In an ideal world, I would separate variables for Female CEO and a female in top management but, there is not enough power to separate estimates for each of the gender-based variables. This is most probably due to the fact that there is a very small amount of female CEO's in my dataset. As a result, I created the 'FemaleTOP5' variable to correct for the insignificance of the individual gender-based variables.

Overall, the p-value of 'FemaleTOP5' is consistently significant at the 1% to 10% significance level, ranging from $p = 0.002$ to $p = 0.096$ throughout all five specifications in this model.

Although the coefficients are significant, the results clash with existing literature, which find that an increased presence of females among CEO positions and executive teams reduces the amount of funding received from VC investors (Brush, Greene, Balachandra, and Davis 2018); in my study, more females in management appear to increase VC funding. In an ideal world, this result is the effect one would want female CEO's and female executives to have on the amount of capital received. If females truly receive capital when warranted, it would give them the opportunity to progress their businesses just like male CEO's and executives have the ability to. The results of my study could be due to recent social acceptance of women from the Me Too Movement (MacKinnon 2019). This campaign has led to more discussion of equal hiring between men and women, as well as equal pay and representation in politics, according to MacKinnon (2019).

From a venture capitalist's perspective, one would have more trust in a company with a female in the top 5 C-suite members. This might be because females have to prove themselves more than their male counterparts to be in these top and prestige positions to begin with, which would make VC investors more at ease when investing money in specific projects (Horowitz, Igielnik, Parker 2018). Although many individuals are aware of the disparity in top level management, there is a still an ongoing tendency for males to be chosen for executive positions, even if there are women of the same level (Jericho

2017). In addition, if a company facilitated in pushing for a female to reach a top level position, then the firm, too, might employ other successful modern aspects of corporate governance principles. The individuals at companies who promoted women moving up the leadership ladder might have a more modern way of looking at top management composition than an archaic company. The remainder of the variables in this model have the anticipated effects and are briefly discussed below.

With regards to ROA (p value of 0.000; coefficient = 1.05; s.e. = 0.150), it has a positively increasing effect on VC funding. Hence, if a company believes that a firm will be successful, they will invest their time and capital in these firms (McKinsey 2007, 2013). My findings support current literature about year of IPO (coefficient = 0.632, s.e. = 0.206): Jiang (2018) found that IPO activity had a spurt in 2018, which was due to the healthcare and technology industry. In terms of industry, both pharmaceuticals and biotech, as well as software, have significant results (coefficients = 0.415 and 0.442; s.e. = 0.241 and 0.262). These findings are consistent with Brush, Greene, Balachandra, and Davis (2018), who find that the artificial intelligence is booming, but that women receive more funding in the biotechnology industry.

After analyzing the effects of the joint gender variable and the other explanatory variables, I am able to see the positive relationship of all factors with venture capital funding. Now that I have established a relationship between the presence of a female in top management and VC funding, the remainder of the paper discusses whether these two variables, in combination, influence firm performance.

4.2 Firm Performance

I now look into the performance of a firm after the IPO and more specifically, after the companies have received capital funding. I estimate the following model:

(2) $PostPerf_{ft} = \alpha + \beta_1 lnVCF_{ft} + \beta_2 FemaleTOP5_{ft} + \beta_3 ROA_{ft} + \beta_4 FemaleTOP5_{ft} * lnVCF_{ft} + \eta_i + \eta_s + \eta_t + \epsilon_{ft}$

where 'PostPerf ' is the average annualized buy and hold return during the publicly traded life of the firm through the end of December 2018. **'**lnVCF' is the natural logarithm of the amount of venture capital funding received by the firm. I predict that venture capital funding would have a positive and significant effect on average annualized return because the amount of capital received would greatly attribute to the overall success of a firm. I also include an interaction variable, '$FemaleTOP5_{ft} * lnVCF_{ft}$,' to see if there would be a differential effect of gender of the management team and VC funding on post funding performance of the firms. All other variables are as previously described in equation (1). As I did with equation (1), I estimate several specifications, successively adding covariates, to see if my main variables (FemaleTOP5, VC funding, and the cross term variable) continue to have effects.

Table 3 presents the results based on equation 2. Unlike the findings where gender composition of the executive team influences VC funding, in this model, in general, I find that the gender distribution of the top management team does not affect firm performance. In particular, when I jointly test 'FemaleTOP5' with 'FemaleTOP5*lnVCFunding,' the result is insignificant. According to previous literature, the performance of firms appears to be greater when there is a larger percentage of

female leaders in top management (Catalyst 2007 and Credit Suisse 2012). On the other hand, my findings are in sharp contrast with those of Catalyst (2007) and Credit Suisse (2012). There appears to be a debate in literature between findings of Credit Suisse and Catalyst vs. those of Verheul and Thurik (2001), where they do not find a positive effect of gender on firm performance. Accordingly, my results coincide with those that find no effect. The insignificance of the joint test at all specification levels implies that the performance of firms is becoming less dependent on gender of company leaders. Moreover, Verheul and Thurik (2001) conclude that although women may receive less funding, their companies are equally as profitable, and sometimes even more successful, than male run companies. Overall, my results suggest that gender diversity appears to have an immaterial effect on company performance.

However, I view this result as a positive concept. If the effect of gender is indeterminate on a firm's performance, then the stereotypes towards female leaders must therefore fade. Hence, male CEO's and executives are not the sole reason for a company's success, and women are slowing making an impact in corporate leadership positions. Both men and women bring different beneficial aspects to the corporate world, whether it be women's focus on teamwork and passion, or men's ability to be assertive and confident. These traits all contribute to a firm's success in distinct and helpful ways.

Venture capital funding does not affect performance, as evident with the joint test between the interaction term and VC funding. Also, there is no differential effect of VC funding based on whether or not management has a woman on the top management team. My findings are different from existing literature (Poczter and Shapsis 2017), where they

find a positive and significant coefficient for capital provided on company performance. The results of my study imply that previous literature is misplaced because there is no statistical significance of capital financing on firm performance. This could be due to the fact that firms in the study were never ready to have an IPO, so the funding has a neutral effect on the performance of the firms. Accordingly, I narrow down the scope of firms to just firms that have exited with an IPO in the US within 2016 and 2018. My data also captures more recent time periods than previous research.

Moreover, consistent with existing literature, my results for operating ROA explain that investors expect companies to become profitable in the future, even though it may not seem like they have potential in their current states (Wohlner 2012, Jasinski 2019). In other words, the results suggest that a company's current operating status does not have a large impact on performance post funding. Finally, industry, state, and year fixed effects do not appear to influence post funding performance.

V. Conclusion

Even though women have made progress in the workforce in contemporary years, the continuing gender disparity of CEO's and top executives makes gender diversity a continued topic of interest. Existing literature illustrates that firms with female CEO's or executives are associated with lower VC investment, and therefore, lower valuations (Poczter and Shapsis 2017; Brush, Greene, Balachandra, and Davis 2018). But, studies also find that gender diversity improves overall company culture with an emphasis on an all-encompassing environment for women (McKinsey 2007; Dezso and Ross 2012). Interestingly, some of the existing literature also indicates that even though women

receive less funding than males, they sometimes generate higher earnings and performance metrics (Catalyst 2007).

Existing literature has a number of potential shortcomings. Specifically, Brush et. al (2018) only covers data from covers the time period from 2011 to 2013. Also, Brush et. al (2018) does not analyze any performance metric of the sample of firms prior to receiving funding. Additionally, this piece of research examines the proportion of female CEO's and primary executives, but they do not include a variable quantifying the effects of women in top management. Lastly, while Brush's paper does address the gender disparity in capital provided, it does not address this gender disparity among the various venture capital industries (angel financing, incubator backed, private equity, etc.). Therefore, the purpose of this paper is to fill the aforementioned gaps. Specifically, the population of executives within firms has largely changed and grown since 2013, so I analyze data from 2016 to 2018. In addition, I analyze the operating ROA prior to funding for each firm and test its effect on the likelihood and amount of capital received. Finally, I add an indicator variable, 'FemaleTOP5,' to analyze the effects of having female CEO's or female executives on funding and performance.

Using data from PitchBook and WRDS from 2016 to 2018, I formally analyze the impact that gender diversity among CEO's and executives has on VC funding and firm performance. I use a sample of 364 companies that exited with an IPO within the U.S. in this time frame. I utilize two separate Ordinary Least Squares (OLS) models with adjusted standard errors to correct for auto correlation. I predict, before analyzing data, that firms with higher levels of gender diversity in CEO and executive positions will

receive less funding, and therefore, generate lower earnings than firms with lower levels of gender diversity.

I find that gender diversity within CEO and top executive positions appears to have an increasingly positive effect on VC funding, but a neutral effect on firm performance. In spite of past research which finds that the presence of females in corporate leadership greatly decreased investment from venture capital firms, my findings are perhaps representative of the improvements of the workplace since 2013 towards a more gender inclusive economy for women. Lastly, results from my study suggest that an increase in gender diversity among executives has an inconsequential effect on post funding performance of firms. Because I did not determine any significant performance differences between male and female run companies, it is quite surprising that females are sometimes excluded from the market for venture capital funding. In closing, my findings suggest that increases in gender diversity among executives has a positive effect in increasing the amount of VC funding, but has no significant influence on firm performance thereafter.

A limitation to my study is that I only analyze the time period from 2016 to 2018. As gender diversity continues to evolve and improve within the corporate world, the subjects of VC funding and firm performance should constantly be re-evaluated in order to remain up to date with current movements. Moreover, my paper examines a narrow group of firms that exited with an IPO in the U.S. My findings are, therefore, only representative of American culture and are not applicable globally. Future research could expand on this analysis by looking at companies across the world to see if there are any

differences in leadership across cultures and how this in turn affects funding and performance.

Additionally, my study only focuses on firms that have exited with an IPO. It may be helpful to study firms that are not on the public market and see how females' roles within those respective private companies changes how they operate. In my study, I also assume that the quality of leadership of the female executives is embedded in firm characteristics. But it might be important to measure how the effect of education, values, and achievements of the female herself impacts decision making within firms. One could also simultaneously look into if the corporate governance principles or characteristics are stronger with females in top management positions, compared to those without females.

Past research suggests that some venture capital investors are under the impression that women cannot successfully run their own businesses. However, my findings imply that women have the intellect and drive to establish and lead strong and wealthy companies. Perhaps females will be more likely to reach their full potential if they are viewed in the same respect and light as men in leadership. Capital funding is important to a business's success story, but what is even more crucial is working to improve women's access to capital financing, so that more women can be brought to the foreground of today's economic hub.

VI. Tables

Table 1: Summary Statistics

Variables	Total	Female TOP5 == 1	FemaleTOP 5 == 0
	(1)	(2)	(3)
VC Funding	336.09	332.53 **	337.57 **
	(643.42)	(428.58)	(714.82)
Female TOP5	0.294		
	(0.456)		
Annualized Return	-0.088	0.068 *	-0.153 *
	(1.156)	(1.932)	(0.579)
Operating ROA	-0.258	-0.21 ***	-0.28 ***
	(0.58)	(0.30)	(0.67)
Year			
2016	0.231	0.159	0.26
	(0.446)	(0.367)	(0.44)
2017	0.324	0.318	0.33
	(0.469)	(0.468)	(0.47)
2018	0.445	0.523	0.41
	(0.498)	(0.502)	(0.49)
State Headquarters			
Texas	0.055	0.075	0.047
	(0.228)	(0.264)	(0.211)
New York	0.044	0.047	0.043
	(0.205)	(0.212)	(0.203)
North Carolina	0.033	0.028	0.035
	(0.179)	(0.166)	(0.184)
Massachusetts	0.126	0.187	0.101
	(0.333)	(0.392)	(0.302)
California	0.269	0.336	0.241
	(0.444)	(0.475)	(0.429)
Non US Headquarters	0.071	0.065	0.074
	(0.258)	(0.248)	(0.262)
No HQ State	0.129	0.103	0.140
	(0.336)	(0.305)	(0.348)
HQ in other state	0.272	0.159	0.319
	(0.446)	(0.367)	(0.467)
Industry			
Pharmaceuticals & Biotech	0.310	0.439	0.40
	(0.463)	(0.499)	(0.50)
Software	0.165	0.196	0.12
	(0.372)	(0.399)	(0.33)
Healthcare	0.104	0.056	0.08
	(0.301)	(0.231)	(0.28)
Commercial Products	0.038	0.019	0.00
	(0.193)	(0.136)	(0.00)
Commercial Services	0.049	0.028	0.04
	(0.217)	(0.166)	(0.20)
Exploration, Production, and Refining	0.027	0.009	0.04
	(0.164)	(0.097)	(0.20)
Consumer Durables & Non Durables	0.049	0.037	0.04
	(0.217)	(0.191)	(0.20)
Other Financial Services	0.036	0.009	0.00
	(0.186)	(0.097)	(0.00)
Other Industries	0.220	0.206	0.28
	(0.415)	(0.406)	(0.46)

*** Indicate significance at 1%

** Indicate significance at 5%

* Indicate significance at 10%

Table 2: Determinants of Venture Capital Funding

[OLS coefficients and Standard Errors]

Note: This table represents the results of the regression, which aims to explain what variables affect venture capital funding. More specifically, it looks into the impact of gender on venture capital funding. 'FemaleTOP5' is a binary variable, indicating the existence of a female as one of the top 5 C-Suite members. 'lnVCFunding' indicates the cumulative amount of funding received from venture capital firms until the date of IPO.'OperatingROA' measures investors' expectations of a company's ROA in the future.

Independent Variable	(1)	(2)	(3)	(4)	(5)
FemaleTOP5	0.570 ***	0.513 ***	0.436 **	0.346 *	0.304 *
	(.177)	(.177)	(.175)	(.178)	(.182)
Operating ROA		0.867 ***	0.879 ***	0.976 ***	1.052 ***
		(.138)	(.136)	(.142)	(.151)
Intercept	4.658 ***	4.899 ***	4.570 ***	4.541 ***	4.383 ***
	(.101)	(.103)	(.172)	(.328)	(.356)
Year Fixed Effects	No	No	Yes	Yes	Yes
State Fixed Effects	No	No	No	Yes	Yes
Industry Fixed Effects	No	No	No	No	Yes
R-Squared	0.0252	0.1209	0.1573	0.1833	0.2033
Observations	364	364	364	364	364

*** Indicate significance at 1%

** Indicate significance at 5%

* Indicate significance at 10%

Table 3: Determinants of Post Funding Firm Performance

[OLS coefficients and Standard Errors]

Note: This table represents the results of the regression, which aims to explain what variables affect average annualized return. More specifically, it looks into the impact of gender on firm performance. 'FemaleTOP5' is a binary variable, indicating the existence of a female as one of the top 5 C-Suite members. 'lnVCFunding' indicates the cumulative amount of funding received from venture capital firms until the date of IPO. 'FemaleTOP5*lnVCFunding' is an interaction term to see if there would be a differential effect on post funding performance. 'OperatingROA' measures investors' expectations of a company's ROA in the future.

Independent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FemaleTOP5	0.221 *	0.210	0.829	0.758	0.723	0.703	0.751
	(.133)	(.135)	(.545)	(.55)	(.551)	(.557)	(.562)
lnVCFunding		0.020	0.039	0.024	0.031	0.040	0.043
		(.038)	(.041)	(.043)	(.044)	(.044)	(.045)
FemaleTOP5 * lnVCFunding			-0.120	-0.107	-0.098	-0.097	-0.113
			(.103)	(.104)	(.104)	(.106)	(.107)
Operating ROA				0.112	0.105	0.040	0.054
				(.11)	(.111)	(.117)	(.124)
Intercept	-0.153 **	-0.246	-0.334	-0.234	-0.248	-0.085	-0.133
	(.072)	(.189)	(.203)	(.226)	(.244)	(.328)	(.345)
Year Fixed Effects	No	No	No	No	Yes	Yes	Yes
State Fixed Effects	No	No	No	No	No	Yes	Yes
Industry Fixed Effects	No	No	No	No	No	No	Yes
R-Squared	0.0076	0.0084	0.0122	0.015	0.0185	0.048	0.0625
Observations	364	364	364	364	364	364	364

*** Indicate significance at 1%

** Indicate significance at 5%

* Indicate significance at 10%

Table 4

Data Definitions

Variable	
lnVCFunding	Natural logarithm of venture capital funding
FemaleTOP5	Dummy variable equal to 1 if CEO or executive is female
AnnualizedReturn	Measures the avergae annualized return, which is how much money is generated from the investment in each firm
OperatingROA	Measures the fraction of Operating Profit (EBIT) over Total Assets of each firm
nohqstate	Dummy variable equal to 1 if there was no state headquarters reported for the firm
pharm_biotech	Dummy variable equal to 1 if the industry the company operates in is Pharmaceuticals and Biotechnology
software	Dummy variable equal to 1 if the industry the company operates in is Sofware
healthcare	Dummy variable equal to 1 if the industry the company operates in is Healthcare
comprod	Dummy variable equal to 1 if the industry the company operates in is Commercial Products
comserv	Dummy variable equal to 1 if the industry the company operates in is Commercial Services
exp_prod_ref	Dummy variable equal to 1 if the industry the company operates in is Exploration, Production and Refining
othfin	Dummy variable equal to 1 if the industry the company operates in is Other Financial Services
con_dur_ndur	Dummy variable equal to 1 if the industry the company operates in is Consumer Durables and Non Durables
hq_tx	Dummy variable equal to 1 if the industry the company is headquartered in Texas
hq_nc	Dummy variable equal to 1 if the industry the company is headquartered in North Carolina
hq_ny	Dummy variable equal to 1 if the industry the company is headquartered in New York
hq_ma	Dummy variable equal to 1 if the industry the company is headquartered in Massachusetts
hq_ca	Dummy variable equal to 1 if the industry the company is headquartered in California
hq_othstate	Dummy variable equal to 1 if the industry the company is headquartered in any other state
y2016	Dummy variable equal to 1 if year of IPO is 2016
y2017	Dummy variable equal to 1 if year of IPO is 2017
y2018	Dummy variable equal to 1 if year of IPO is 2018
ftopvcf	Interaction term representing FemaleTOP5*lnVCFunding

VII. References

American Express Open. 2017. “The 2017 State of Women-Owned Businesses Report.”

McKinsey & Company. 2007. “Gender diversity, a corporate performance driver.” *Women Matter 2007.*

McKinsey & Company. 2013. “Gender diversity in top management: Moving corporate culture, moving boundaries.” *Women Matter 2013.*

Everett, Thorne, Danehower. 1996. “Cognitive Moral Development and Attitudes towards Women Executives.” *Journal of Business Ethics* 15, no. 11: 1227-1235.

Herring. 2009. “Does Diversity Pay?: Race, Gender, and the Business Case for Diversity.” *American Sociological Review* 74, no. 2: 208-224.

Deszo, Ross. 2012. “Does Female Representation in Top Management Improve Firm Performance? A Panel Data Investigation.” *Strategic Management Journal 33, no.* 9: 1072-1089.

Barsch, Yee. 2011. “Unlocking the full potential of women in the U.S. economy.” *McKinsey & Company.*

Credit Suisse. 2014. “The CS Gender 3000: Women in Senior Management.”

Brush, Greene, Balachandra, Davis. 2018. “The gender gap in venture capital- progress, problems, and perspectives.” *Venture Capital: An International Journal of Entrepreneurial Finance.*

Verhuel, Thurik. 2001. “Start-Up Capital: ‘Does Gender Matter?’” *Small Business Economics,* Vol. 16, No. 4 Special Issue on European Approaches to Small Business Research: Papers from the XIII European Research into Entrepreneurship (RENT) Workshop: 329-345.

Poczter, Shapsis. 2017. “Gender disparity in angel financing.” *Small Business Economics* 51: 31-55.

Marino, Jonathan. 2015. “The US IPO Market has gone cold.” *Business Insider.*

Jiang, Ethel. 2018. “Here’s how 2018’s biggest US IPOs have performed.” *Markets Insider.*

Warner, Ellmann, Boesch. 2018. “The Women’s Leadership Gap.” *Center for American Progress.*

Funk, Parker 2018. “Women and Men in STEM Often at Odds Over Workplace Equity.” *Pew Research Center.*

Terry, Mark 2018. “10 Women Biotech CEOs Lead the Charge.” *Bio Space.*

Funk, Parker 2018. “Women in STEM see more gender disparities at work, especially those in computer jobs, majority-male workplaces.” *Pew Research Center*.

Wohlner, Roger 2012. “Investing: It’s About Expectations.” *U.S. News.*

Jasinski, Nicholas 2019. “The Market Loves Money-Losing IPOs. Here’s Why.” *Barron’s.*

Hinchliffe, Emma 2019. “Funding For Female Founders Stalled at 2.2% of VC Dollars in 2018.” *Fortune.*

Wiltermuth, Joy 2019. “Yield gap between risky corporate debt and investment grade sinks to 12-year low.” *MarketWatch.*

Feloni, Richard 2014. “The 7 Worst Stereotypes Professional Women ace.” *Business Insider.*

Jericho, Greg 2017. “Men still dominate managerial positions. The excuses are running out.” *The Guardian.*

Horowitz, Igielnik, Parker 2018. “Women and Leadership 2018: Wide gender and party gaps in views about the state of female leadership and the obstacles women face.” *Pew Research Center*.

MacKinnon, Catharine 2019. “Where #MeToo Came From, and Where It’s Going.” *The Atlantic*.